



Basin annual environmental watering priorities 2021–22

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Acknowledgement of the Traditional Owners of the Murray–Darling Basin

The Murray–Darling Basin Authority pays respect to the Traditional Owners and their Nations of the Murray–Darling Basin. We acknowledge their deep cultural, social, environmental, spiritual and economic connection to their lands and waters.

The guidance and support received from the Murray Lower Darling Rivers Indigenous Nations, the Northern Basin Aboriginal Nations and our many Traditional Owner friends and colleagues is very much valued and appreciated.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.

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Introduction

Climate conditions forecast for the coming water year are much more favourable than the past few years for environmental water managers to plan and deliver water for the environment across the Murray–Darling Basin. However, while flows and connectivity have improved across much of the Basin in recent months, in many cases the environment has not responded as well as might have been expected. In particular, long-parched floodplain soils have soaked up much of the initial rainfall. Significant rainfall has occurred downstream of dams in some catchments which has contributed to most storage volumes across the Basin remaining at levels around 60%. Total basin storages at 23 June 2021 was 62%.

As a result, despite improved inflows to the Basin, the challenge for environmental water managers to prioritise water use is expected to continue for the 2021–22 water year. The key driver for prioritising water for the environment for the 2021–22 water year is the need to continue to support drought recovery. Supplementing natural flooding will:

- extend periods of inundation on floodplains and wetlands to support native vegetation
- support waterbird breeding, and
- assist movement and/or recruitment of native fish, including for previously translocated and/or threatened species.

This will serve to gradually build resilience of key habitats and species across the Basin in the face of a changing climate.

Basin annual environmental watering priorities

'Water for the environment' is used to improve the health of our rivers, wetlands and floodplains. Providing water for the environment helps to achieve the vision of a healthy Murray–Darling river system for the benefit of the communities that rely on it.

To help achieve this vision, the Murray–Darling Basin Authority (MDBA) publishes annual environmental watering priorities for the Basin. These identify where water for the environment can be best used across the Basin each year, providing a Basin view of were the environment needs most help.

The priorities represent the recommended focus areas for the year ahead that will help achieve the desired long-term outcomes for the Basin environment as described in the <u>Basin-wide environmental</u> <u>watering strategy</u> (BWS)¹. The guidance provided by the priorities helps federal and state environmental water holders across the Basin, who make decisions about when, where and how much water is provided for the environment.

<u>Multi-year priorities</u> referred to as 'rolling priorities', are also provided to address areas where environmental watering is important across multiple years. These work together with the annual priorities.

Catchment conditions and forecasts relevant to setting annual priorities

Big dry and big wet

Recent climate and flow conditions remain an important consideration for determining Basin-scale annual watering priorities.

The Basin has recently experienced three years of warm and dry conditions (2017–19) beyond what is typical, which has affected the health of the river system. This period has been recorded as the hottest three-year period on record for the Basin (Figure 1).

Catchments across the Basin were very dry and extremely dry in the north. Baseflows in many rivers and creeks across the Basin were low, with systems in the north experiencing wide-spread and extended cease-to-flow events, sometimes spanning years.

¹ The Basin-wide Environmental Watering Strategy (BWS) supports the implementation of the Basin Plan and is a key component of the adaptive management of environmental water to achieve Basin Plan outcomes. Along with other planning processes, it assists environmental water holders, Basin governments, and waterway managers to plan and manage environmental watering at a Basin-scale and over the long-term to meet the Basin Plan's environmental objectives.

This hot-dry period contributed to the unprecedented Black Summer bushfires (2019–20) across most states and the Australian Capital Territory. The fires occurred in approximately 15% of the Basin.

Heavy rainfall in early 2020, the 'northern flow event', led to thousands of kilometres of rivers in the northern Basin flowing for the first time in many months, and the first connection of the Darling and Murray rivers in two years. However, the reprieve was short lived – with storages remaining low and cease-to-flow conditions returning in some areas; annual inflows to the River Murray system also remained well below average.

This earlier rain served to prime river channels and floodplains, increasing the runoff response to the heavy falls received in late 2020 – early 2021. The outcome was minor to major flooding in all northern Basin catchments. The Barwon–Darling received substantial inflows, as did the Ramsar-listed wetlands, the Narran Lakes, the Macquarie Marshes and the Gwydir Wetlands. Menindee Lakes filled for the first time in five years after inflows began arriving in late March 2021.



Figure 1: Mean maximum temperature deciles 1 January 2017 to 31 August 2019, based on all years since 1910 (Source: Bureau of Meteorology)

Climate context for 2021–22

The Bureau of Meteorology (BoM) provides advice on the most likely climate conditions ahead. Depending on the climate drivers at play, longer-term forecasts (i.e. 3 months or more) can be difficult to narrow down. Climate drivers such as the El Niño–Southern Oscillation (ENSO) and the Indian Ocean Dipole (IOD), when not neutral, are known to play a role in driving our climate across the year.

As of 20 July 2021, the BoM has advised that a negative IOD is underway. A negative IOD at this time of year increases the likelihood of above average winter–spring rainfall for much of southern and eastern Australia.

The El Niño–Southern Oscillation (ENSO) is neutral and the BoM advises this is likely to remain so until at least spring. The BoM's *Outlook for August to October* is for a greater chance of 'wetter than average' conditions for most catchments across the Basin (Figure 2).



Figure 2: Chance of above average rainfall from July to September 2021 (Source: Bureau of Meteorology)

The Bureau also advises that average annual cool season (April to October) rainfall has reduced by 10% to 20% across southern Australia in recent decades. The decline in rainfall is consistent with the increase in duration and severity of droughts, including the Millennium drought and the more recent record-breaking drought which have both significantly impacted the Basin.

In considering all factors, the Bureau further advises that persistent, widespread, and above-average rainfall is needed to lift areas out of prolonged rainfall deficiencies and to provide relief from the longer-term impacts of the long period of low rainfall, such as by recharging water storages.

The capability to confidently forecast the weather and streamflow beyond spring is still developing. The Basin-wide annual watering priorities mostly considered the current condition of the environment as the environmental water holders undertake planning that considers all conditions from very wet to very dry. Under wetter years, in some locations the Basin annual watering priorities may be met from natural streamflow, which allows the environmental water holders to use their water to help other parts of the environment.

Basin annual watering priorities for 2021–22

Basin-wide annual watering priorities and guidance for environmental water holders has been prepared for river flows and connectivity, native vegetation, waterbirds, and native fish. The key driver for prioritising water for the environment for the 2021–22 water year is the need to continue to support drought recovery. Refer Table 1 for more detail.

Flows and connectivity

The two overarching or rolling priorities for flows and connectivity in the Basin are: to connect rivers to their floodplains and improve connectivity along rivers systems; and to support freshwater connectivity through and between the Lower Lakes, Coorong and Murray Mouth. As noted above, the recent unprecedented dry and hot period contributed to rivers ceasing to flow and drought refuges drying out.

Widespread natural flooding in 2020–21 has improved flows along rivers as well as connection to wetlands in numerous catchments. However, some areas, such as Chowilla Floodplain in South Australia, have missed out and long-standing rainfall deficiencies mean more support is needed to restore the Basin's water-dependent ecosystems. With winter / spring forecast to be wet, supplementing natural inundation of floodplains and wetlands is encouraged.

The key focus to improve flows and connectivity in 2021–22 is to support opportunities to connect rivers across borders and between catchments, including connectivity between the northern and southern basin via the lower Darling, and to mitigate dry conditions by providing baseflow to areas with extended cease-to-flow periods. Providing water to high conservation areas that have not received water since the 2016 floods will also be important, along with managing salinity and water levels in the Coorong to support *Ruppia* to set seed. Refer Table 1 for more detail.

Native vegetation

Riparian and floodplain vegetation is a critical component of the Murray–Darling Basin's rivers, wetlands and landscapes. It provides habitat for many terrestrial and aquatic fauna and supports many significant ecological functions and highly valued ecosystem services. Native vegetation is typically a mix of trees, understorey plants, and water-dependent aquatic plants. The distribution, density and diversity of native vegetation communities vary throughout the Basin, influenced largely by river flows and climate.

The Millennium drought left many vegetation communities in poor condition, with many yet to show significant signs of recovery and improvement. Environmental water delivered under the Basin Plan is supporting some positive outcomes for native vegetation extent, diversity and condition. Trends indicate that river red gum and coolabah communities are faring significantly better than black box communities under prevailing dry conditions. Black box is now considered to be in poor condition across the Basin, which is exacerbated by the difficulty in getting environmental water to the higher parts of the floodplain.

Monitoring of the Lower Lakes between 2007 to 2019 revealed a gradual recovery of diversity in submerged and littoral plant communities after the Millennium drought, and a maintenance of diversity since implementation of the Basin Plan. The critical plant of the North Lagoon of the Coorong, *Ruppia megacarpa*, disappeared during the Millennium drought. In the South Lagoon of the Coorong, *Ruppia tuberosa* has significantly improved in extent since implementation of the Basin Plan, however there is currently no viable seedbank, the period of turion production is reduced, and smothering by filamentous algae is limiting seed set.

Overall, condition of native vegetation has been largely maintained at pre-Basin Plan and post-Millennium drought levels, but to varying degrees between catchments. However, the 2020 Evaluation of the Basin Plan highlighted that there is an ongoing paucity of Basin-scale and consistent native vegetation data, particularly for non-woody types, which is hindering assessments.

Annual priorities for native vegetation in 2021–22 focus on achieving and extending inundation at key sites to support woody and non-woody vegetation including river red gum, black box and coolabah communities. Supporting recovery, reproduction and resilience of *Ruppia* through environmental water delivery to manage water level and salinity in the appropriate seasons is an urgent priority. Refer Table 1 for detail.

Waterbirds

The Basin supports more than 120 species of waterbirds. Populations of waterbirds have declined since the peaks recorded in the 1980s, before the Millennium drought, however the Basin remains one of the most important sites nationally and internationally for colonial nesting and migratory waterbird species. These birds congregate on inundated wetlands across the Basin and at terminus of the system – the Lower Lakes, Coorong and Murray Mouth. The variety and condition of habitat, along with food resources, are key factors influencing distribution and abundance of waterbird species. In turn, these factors are influenced by water.

Since the Basin Plan commenced, species richness (number of waterbird species) has remained steady. However, abundance (populations) has remained very low and breeding has been infrequent. Peaks in colonial nesting waterbird breeding coincided with the large flood events of 2016–17. Measured breeding success at sites that received environmental water indicates success rates of 40% to 66%.

Only a small fraction of environmental water use under the Basin Plan has been specifically for waterbirds. Delivering environmental water at the required duration and flow for colonial breeders is operationally challenging. During 2020–21, waterbird breeding was successful at several sites in the northern and southern Basin where environmental watering supplemented natural flows.

In the northern Basin, small bird breeding events occurred in the Gwydir Wetlands, Narran Lakes and the Macquarie Marshes. In the southern Basin, colonial nesting species bred at Barmah–Millewa Forest and at several sites in the Murrumbidgee including Nimmie Caira and Eulimbah Swamp, while a storm disrupted nesting pelicans at Lake Brewster in the Lachlan. At the end of the system, waterbird populations have declined in both the Coorong and Lower Lakes since 2020. This trend is due to a decline in foraging habitat and food availability, which are affected by factors related to water level, salinity, temperature, and pests. Supporting waterbird breeding where it occurs naturally, in particular in key wetlands for colonial nesting waterbird as well as for shorebirds is a focus for the 2021–22 water year. Protecting foraging and nesting habitat including in the Lower Lakes, Coorong and Murray Mouth will be important to support waterbird populations.

This annual guidance acknowledges both place-based and Basin-scale priorities for waterbirds; it is recognised that waterbirds are opportunistic and require a Basin-wide approach to ensure populations are supported. Refer Table 1 for details.

Native fish

Before the Basin Plan came into force in 2012, the status of native fish was considered to be poor, at around 10% of pre-European settlement levels. The 2020 Evaluation of the Basin Plan, which assessed data up to mid-2019, reported that native fish in the southern Basin had largely been maintained, with some improvements in threatened native fish species in the Lower Lakes. Significantly, post-Millennium drought environmental watering has supported lamprey migrations for the past decade. The 2020 Evaluation also reported some improvements in native fish in the northern Basin. However, the worst years of drought on record in the northern Basin (2017–2019) combined with the unprecedented bushfires over Black Summer of 2019–20, resulted in at least 60 fish death events, most occurring in the northern Basin. During the recent drought, delivery of environmental water was instrumental in supporting native fish sheltering in critical refuge waterholes.

Summer and autumn rainfalls this year have resulted in some of the best flows since 2011, with good inflows to Menindee Lakes. Recent fish monitoring indicates that system-scale connectivity has occurred, with golden perch spawned in the northern Basin dispersing downstream through the Darling to Menindee Lakes. With suitable flows, sub-adult golden perch are likely to disperse through the lower Darling to the River Murray. Such an improved flow regime will aid the lower Darling fish community to recover from the mass fish death events of recent years and support the post-drought recovery of native fish populations more generally.

Coordinating and supplementing naturally triggered flow events with environmental water, at appropriate times, is a focus for the 2021–22 water year to assist with the recovery of native fish following drought. While this focus is most appropriate in the northern Basin, it can also be targeted to specific species and locations. Refer Table 1for detail.

First Nations environmental watering objectives

The MDBA used guidance from First Nations in developing the priorities in 2020–21, under the First Nations Environmental Water Guidance (FNEWG) Project. This collaboration provided opportunities for First Nations to influence Basin-scale prioritisation of environmental outcomes, with complementary cultural benefits.

Recognising that independent, culturally authoritative and strategic input from First Nations people can improve environmental watering decisions, the MDBA will be working with First Nations to ensure that the Basin-wide environmental watering strategy (3rd edition) will include First Nations' objectives and outcomes for shared benefits of environmental water. As the Basin-wide

environmental watering strategy directs the Commonwealth Environmental Water Office and Basin states with respect to watering priorities, these changes will help First Nations have more influence in how water is managed to protect and restore the Basin environment.

Connecting water to Country via floodplains, creeks and wetlands, to care for the biodiversity of river landscapes, to help plant and animal species recover, and to have healthy waterways for healthy peoples.

First Nations are often involved in planning for the use of water for the environment at a local sitescale, such as individual wetlands and forests. Input such as this helps to guide how water for the river system is delivered throughout the Basin. In the lead up to the 2021–22 water year, environmental water holders in the southern Basin worked alongside First Nations to also plan water use at a broader landscape scale. This involved thinking about the Basin's river systems in a connected, holistic sense, and discussing how water for the environment could be coordinated throughout the southern Basin to provide environmental and cultural outcomes.

As part of this system-scale approach, in April 2021 a forum on Latji Latji Country in Mildura saw Traditional Owner representatives from many parts of the southern Murray–Darling Basin come together to share information about the health of Country and discuss preferred outcomes from the management of environmental water. The forum identified key locations, species and themes, such as connectivity and biodiversity, for water use next year. Participants also emphasised the need for continued strengthening of partnerships between water agencies and First Nations. Outputs from the workshop were presented to SCBEWC and will be incorporated into environmental water planning for 2021–22, including the CEWO's annual plans and the SCBEWC Operational Scenarios document.

First Nations will assess how their input was applied by environmental water managers. The various agencies involved also committed to report back about how this important contribution was applied and to continue to involve First Nations in the planning of water for the environment.

Table 1: Basin watering priorities for 2021–22

Watering Priorities	Flows and connectivity (FC)	Native Vegetation (V)	Waterbirds (B)	Native Fish (F)
Basin – Rolling Priorities (multi-year) (R)	 RFC1. Support lateral and longitudinal connectivity along the river systems. RFC2. Support freshwater connectivity through and between the Lower Lakes, Coorong and Murray Mouth. 	 RV1. Allow opportunities for growth of non-woody wetland vegetation. RV2. Allow opportunities for growth of non-woody riparian vegetation. RV3. Maintain the extent, improve condition and promote recruitment of forests and woodlands. RV4. Maintain the extent and improve the condition of lignum shrublands. RV5. Expand the extent and improve the condition of Moira grass in Barmah–Millewa Forest. RV6. Expand the extent and improve resilience of <i>Ruppia tuberosa</i> in the southern Coorong. 	 RB1. Maintain the diversity and improve the abundance of the Basin's waterbird population. RB2. Maintain the abundance of key shorebird species in the Lower Lakes and Coorong. 	 RF1. Support Basin-scale population recovery of native fish by reinstating flows that promote ecological processes across local, regional and system scales in the southern connected Basin. RF2. Improve flow regimes and connectivity in northern Basin rivers to support native fish populations across local, regional and system scales. RF3. Support viable populations of threatened native fish, maximise opportunities for range expansion and establish new populations.

Watering Priorities	Flows and connectivity (FC)	Native Vegetation (V)	Waterbirds (B)	Native Fish (F)
Annual Guidance – North (AN)	 ANFC1. Support cross-border and inter-valley connectivity opportunities. ANFC2. Support connectivity between the northern and southern Basin via the lower Darling. ANFC3. Provide baseflow to areas with extended cease-to-flow conditions. ANFC4. Enhance variability of freshes (i.e. small, medium and large) to meet varied ecological requirements in river reaches. 	 ANV1. Support riparian vegetation and lignum in key wetlands of the northern Basin. ANV2. Extend inundation duration on key sites at Macquarie Marshes. ANV3. Support inundation of the Warrego floodplain. ANV4. Support inundation of the Lower Balonne floodplain. 	 ANB1. Provide water to support colonial nesting waterbird breeding and recruitment triggered by natural flows in the Basinsignificant wetlands such as Narran Lakes, Macquarie Marshes, Gwydir Wetlands. ANB2. Support foraging and nesting of waterbirds by ensuring shallowwater and shoreline habitat. 	 ANF1. Water to support recovery, recruitment and dispersal of native fish populations. ANF2. Enhance connectivity between fish refuge water holes. ANF3. Support Basin-scale downstream dispersal of golden perch juveniles (e.g. from Warrego and Condamine–Balonne via the Darling). ANF4. Provide small pulses (freshes) to support productivity and movement of native fish including re- introduction sites of relocated fish.
Annual Guidance – South (AS)	ASFC1. Reinstate small to medium in-channel flows and overbank flows where practical – particularly at key sites.	ASV1. Increase inundation higher on the floodplain to support parched and stressed forests and woodlands.	ASB1. Provide water to support colonial nesting waterbird breeding and recruitment triggered by natural flows in the Basin-	ASF1. Provide water for lower Darling (Baaka) to support survival of young cohorts of Murray cod and dispersal of golden perch including if

Watering Priorities	Flows and connectivity (FC)	Native Vegetation (V)	Waterbirds (B)	Native Fish (F)
	 ASFC2. Manage salinity and water levels in the Coorong lagoons to support seed set of <i>Ruppia</i>. ASFC3. Where practical, water high conservation areas that have not received water since the 2016 floods. 	 ASV2. Extend inundation of wetlands and floodplains to improve soil moisture and regenerate understorey vegetation; where practical, provide multiple watering events to further extend duration of inundation. ASV3. Enhance recovery of <i>Ruppia</i> extent, turion production and seed bank through improved, seasonally appropriate, water levels and salinities. ASV4. Where practical, promote wetting of bank substrate and snags to promote biofilm growth. 	 significant wetlands such as the Lowbidgee Floodplain. ASB2. Provide flows at adequate levels to support productive shorebird habitat, foraging resource availability, and local breeding – allowing for varying requirements within the different habitats offered by the Coorong and Lower Lakes. ASB3. Avoid loss of adequate foraging and roosting habitat in the Lower Lakes by ensuring water level is not too high. 	required in the Darling Anabranch. ASF2. Ensure small winter flows to support migrations and progressive recovery of diadromous lamprey and congolli. ASF3. Maintain fast-flowing habitats to cue movement and spawning for native fish. ASF4. Provide off-channel habitat to support the entire life cycle of threatened small- bodied native fish including at re- introduction sites of rescued native fish and translocated threatened fish.

Appendix 1



Figure 3: Water Resource Availability Scenario as at 1 June 2021 (Source: MDBA)

Water resource availability scenarios help environmental water managers determine the ecological objectives in particular catchments under different seasonal conditions. The MDBA has determined the RAS at 30 June 2021 (refer Figure 3) as indicating some catchments, particularly the 'wet' catchments in NSW, have good potential to support drought recovery. However, overall, the Basin is still recovering from cumulative long-term impacts of drought. This conveys a degree of vulnerability to aquatic ecosystems Basin-wide and there remains a strong need for Basin-scale watering priorities to continue to support drought recovery.

Office locations Adelaide Albury-Wodonga Canberra Goondiwindi Griffith Mildura Murray Bridge Toowoomba



